

Chapter 4 Analysis of the RMQ

4.1 Introduction

There are 139 completed questionnaires containing 58 questions with on average between 4 and 5 sub-divisions within each question. This gave a total of around 36,000 data points. Analysing such a huge figure requires careful planning and much fore-thought.

The analysis of the questionnaire revolved around a basic model. This model evaluated the data as a whole initially, by referring to the entire set of replies, and proceeded by breaking it down into smaller, but increasingly more relevant sections. The first sub-division were the two industries, oil and gas and construction. These sub-sets were then divided further into job titles, or primary responsibilities.

Correlation coefficients, as well as other statistical tools, were used to obtain links or trends within these specific divisions. The findings from these analyses and from the questionnaires themselves as a unit, are important to both industries for the reasons given in section 3.1. It should be noted here that correlation coefficients were calculated between most sets of relevant and conceivable data. The reader should understand that where correlation coefficients have been mentioned in the text, then a strong enough relationship is present between two sets of data for it to be specified. Otherwise, no, or little, relationships exists.

For reasons given above, the first variable that needed to be specified was the job responsibility, which is the very first question within the questionnaire. It is embodied within the section entitled 'background information', which also identified some general information about the respondent and their company, as well as giving the respondent a gentle feel for the questionnaire and its answering techniques and style.

One more point of interest. Statistics say that reliable conclusions can be obtained from a sample size of 20 or more (Kanji, 1993). Because of the divisions identified in this analysis, samples may be smaller than this number and may lead to some inaccuracies.

4.2 Analysis of Section 1 of the Questionnaire:

'Background Information'

The first section of the questionnaire is entitled 'Background Information'. It is the aim of this section to find out some background information on the respondent and his/her company.

4.2.1 Analysis of primary responsibility of the respondents (Question 1)

Question 1 of the questionnaire was designed to ascertain the *primary* responsibility of each respondent. This was imperative, and then determined which questions he/she answered or could answer, and the validity of those answers. From this information, certain trends about risk management, as a whole, were made concerning the different job responsibilities.

Figure 4.1 illustrates the spread of primary responsibilities of all 139 respondents, from within their respective companies. The primary responsibilities of the respondents covered the principal activity areas of safety/risk, finance, general management, design, construction and insurance. Sixty five percent of the respondents were from the first 3 activity areas. The largest proportion of those respondents were from 'general management'. Just under 25% of respondents deal with 'safety/risk' directly as their primary responsibility. The more popular job titles contained within the 12% of the 'other' category were estimating, technical management, commercial management, costing, legal, and corporate development.

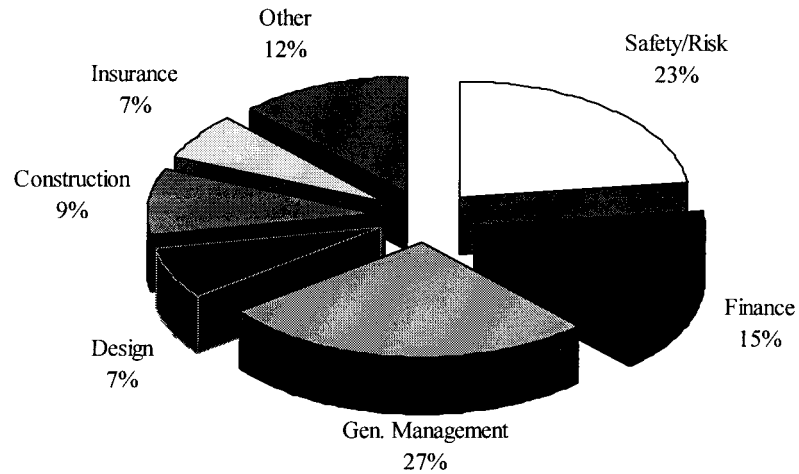


Figure 4.1 *Proportions of primary responsibilities for all the replies*

Figure 4.1 is made up of 93 respondents from the construction industry and 46 from the oil. Figure 4.2 shows how each of these two sectors were proportioned with respect to primary responsibility. Studying Figure 4.2, it is clear to see that there are discrepancies between the two industries, but these differences are relatively small, with the exception of two categories, namely safety/risk and finance. The oil and gas industry are extremely safety conscious because of their working environment and thus there is an ever increasing abundance of risk analysts (or similar titles associated within safety/risk) inside this business (Powell, 1991). This practice has been enhanced by events such as the Piper Alpha, and therefore accountability for safety/risk is of prime importance. On the other hand, the construction industry relies on well established technologies and operates within physical environments considerably less hostile. Thus, safety/risk is not of prime importance and would have less technical risk analysts. The construction industry does, however, operate in a competitive and harsh financial environment (Edwards, 1995), and was reflected in the significantly higher percentage of financial analysts responding to the questionnaire. Therefore, it would seem that the construction industry perceive risk as ‘financial risk’, whereas the oil and gas industry views it as technical.

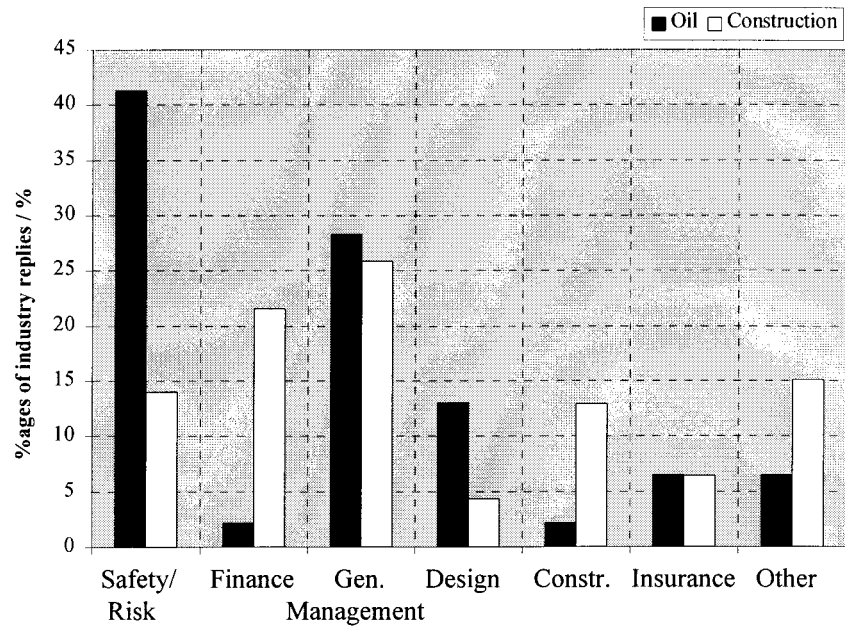


Figure 4.2 *A graph illustrating the percentage proportions of replies for the primary responsibilities between the two industries*

4.2.2 Analysis of age and experience against job responsibility (Questions 2 and 3)

Question 2 is in three parts and identified the respondents’ age, the amount of years that he/she had been involved in the industry, and the duration spent at their present company. Each part of the question is divided into 7 year ranges, e.g. 20-30 years. Figure 4.3 illustrates the spread of ages, categorically, of the entire sample of 139 respondents.

For this analysis and for statistical purposes, if a respondent ticked a particular box, the median, i.e. the middle value, of that range was assumed. So for example, if someone ticked the class 20-30 years as their age bracket, then it was assumed that the respondent was 25 years old. A problem does arise from this assumption. The last class in each of the three parts to this question are ‘over(a certain amount of years)’. For part (a), the last age class is ‘over 55’. It was assumed that no-one, who answers in this box, was over the age of 65, as this is the legal age of retirement; therefore, the median of this class was 60. For parts (b) and (c), the final class is ‘over 31’, and for this analysis it was assumed that no-one works in the industry or

for a company longer than 40 years; therefore, the median for these parts were 35.5 years. Having postulated the median phenomenon, the average time, in years per candidate, spent both in the industry, and at their present company is illustrated in Figure 4.4. Then, by referring back to Figure 4.3, one can work out how many respondents fall into each age category to make up these average values. The *exact* average number of years is visible on the top of each ‘bar’.

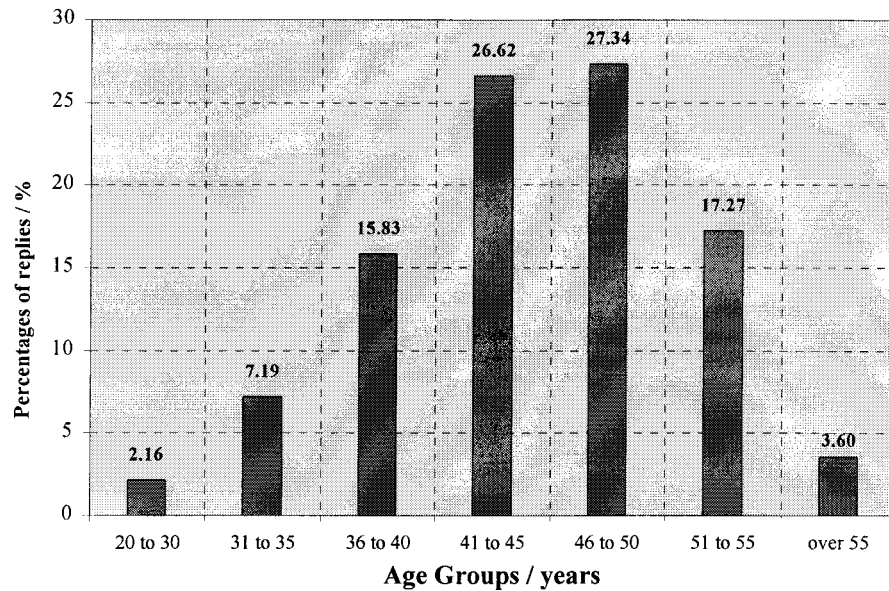


Figure 4.3 *Spread of ages of the entire sample*

By constructing three tables, Table 4.1, Table 4.2 and Table 4.3, it was possible and important to examine the ages and experience of the respondents when sub-divided into their job responsibilities. The tables compare the individual job responsibilities mean and standard deviation values against the ‘overall’ to ascertain whether one job area is younger/older or less/more experienced than the others.

Table 4.1 shows the similarity between the averages ages for the different job areas. The mean age of the entire sample was 44.8 years. The maximum difference of the mean values for the job responsibilities from the overall is approximately 2 years, which is relatively insignificant. The oldest age group was ‘construction’ at 46.8 years. However, this value

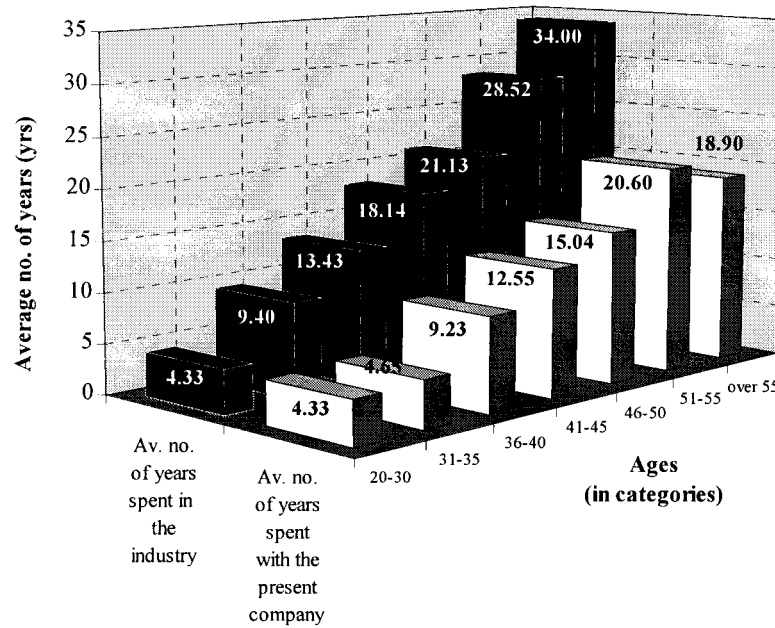


Figure 4.4 *A 3-D bar chart to illustrate average no. of years in both industry and present company within each age class.*

was attained from a small sample size of only 13 respondents. Conversely, with a sample size of 32, the youngest group was ‘safety/risk’. Safety/risk were, on average, approximately 2 years younger than the ‘Overall’ sample, with a larger standard deviation, suggesting a broader spread of ages from this mean.

Job responsibility	Mean (yrs)	Standard deviation (yrs)	Mean - Overall mean (yrs)
Safety/Risk	42.88	8.08	-1.93
Finance	43.95	6.64	-0.86
Gen. Management	45.95	5.97	1.14
Design	44.70	7.53	-0.11
Construction	46.77	7.74	1.96
Insurance	44.67	7.07	-0.14
Other	45.67	7.10	0.86
Overall	44.81	7.05	0.00

Table 4.1 *Table representing mean age against job responsibility*

Table 4.2 offers very similar trends. The overall mean years spent in the industry was 19.7 years. Concentrating more on the extremes of these tables, ‘construction’ tend to spend most years in the industry with a staggering 24.5 years, almost 5 years longer

than the ‘Overall’ stay, but again one must be aware of the limited sample size. The least time spent is ‘safety/risk’, with only 16.3 years. Glancing down standard deviation column, the most significant value of 11.49 is coupled with the ‘finance’ category. The mean value for ‘finance’ is also quite low, suggesting that the experience of these respondents in their current industry is quite diverse.

Job responsibility	Mean (yrs)	Standard deviation (yrs)	Mean - Overall mean (yrs)
Safety/Risk	16.25	7.92	-3.4
Finance	17.52	11.49	-2.13
Gen. Management	21.85	6.60	2.2
Design	19.00	6.99	-0.65
Construction	24.54	6.81	4.89
Insurance	18.83	8.66	-0.82
Other	20.94	8.80	1.29
Overall	19.65	8.51	0.00

Table 4.2 *Table portraying average years in industry against job responsibility*

Finally, the years spent with their present company is the topic of Table 4.3. One can notice that all the values are lower than their respective figures in Table 4.2, which implies the majority of candidates have switched jobs within the industry during their careers. The mean values, however, are clustered and resemble that of the ‘overall’ quite closely. ‘General management’ has the highest mean stay of 15.4 years, with ‘finance’ the least, which complements the value from Table 4.2. ‘Construction’ is another department, like ‘finance’, which is prone to employees moving from one company to another.

Bringing all the information from Table 4.1 to Table 4.3 together, one may conclude that jumping from one job to another within the respective industries is common amongst all divisions. The employees from ‘general management’ do, however, seem to be more stable than the others. Generally, the candidates from ‘safety/risk’ vary considerably in ages but do possess the youngest employees, and have spent less time in the industry than any of the remaining six job responsibilities. This could be because the subject of risk management is still very much in its embryonic stage. The subject, though, is constantly developing and maturing at an alarming rate.

Job responsibility	Mean (yrs)	Standard deviation (yrs)	Mean - Overall mean (yrs)
Safety/Risk	13.47	7.88	-0.11
Finance	12.02	9.08	-1.56
Gen. Management	15.42	8.58	1.84
Design	14.90	9.03	1.32
Construction	12.19	7.08	-1.39
Insurance	12.94	6.71	-0.64
Other	12.32	8.50	-1.26
Overall	13.58	8.23	0.00

Table 4.3 *Table representing average years with present company against job responsibility*

The reasons for the conclusions just made from Table 4.1 to Table 4.3 could be explained, if only partially, by introducing Table 4.4, which summarises the results from question 3. Question 3 ascertains some background information on the respondents' present company. The five scale answering technique employed for question 3 is displayed at the base of Table 4.4. The factors under review, a) to d), are also exhibited. These issues are obviously not the only reasons for employees moving from one company to another, but are arguably four of the more important ones. The averaged values are encouraging for parts a), b) and d) throughout all seven job categories. The values are on or below rank 2, which suggests 'strong satisfaction' for those factors. It is only the promotion opportunities, factor c), which drops lower than rank 2, at around 2.5, which is relatively less satisfactory. When one examines Table 4.3, it is important to use Table 4.4 concurrently. As already pointed out, the persons involved within 'construction' and 'finance' are the quickest to jump from one company to the next. Some of the reasons why this trend occurs within 'construction' can be explained from Table 4.4 with their general attitudes towards a lack of promotion and physical conditions at work. Strangely enough, the employees involved under 'finance' are very satisfied with the criteria specified in question 3, therefore other reasons need to be sought to explain their employment movements, possibly financially oriented. The job responsibilities least contented with promotion opportunities are four-fold, namely 'construction', 'safety/risk', 'insurance' and 'design'. The first three of these categories do not boast a high mean

value for years spent with their present company. The reasons detailed in Table 4.4, and especially promotion opportunities, could explain why. The reason for the negative feeling of promotion within ‘safety/risk’ could be because this field is comparatively new, and promoting such people to the higher echelons of a company is more rare.

4.3 Analysis of section 2 of the Questionnaire

‘General Risk Questions’

Section 2 of the questionnaire is named ‘General Risk Questions’. The objective of this section is to identify some general risk practices and attitudes of the respondents’ respective companies.

Job responsibility	Ques. 3 (a) Opportunities for novel work	Ques. 3 (b) A say in the way processes are handled	Ques. 3 (c) Promotion opportunities	Ques. 3 (d) Physical conditions at work
Safety/ Risk	1.90	1.77	2.84	1.84
Finance	1.52	1.62	1.95	1.81
Gen. Management	1.89	1.95	2.38	2.11
Design	1.60	2.30	2.60	2.20
Construction	2.08	1.85	2.54	2.38
Insurance	1.89	2.22	3.44	2.22
Other	1.65	2.00	2.18	1.94
Overall	1.80	1.90	2.51	2.02

Scale: *Very satisfactory 1 2 3 4 5 not satisfactory.*

Table 4.4 *A table showing the average grades given for question 3 (parts a)-d)) by the entire sample*

4.3.1 *Analysing and summarising questions 4 to 19 inclusive*

These questions are very general and were designed to obtain a feel for the way the companies within the different industries, or the different job responsibilities understand risk management and how their own, and their company’s attitude were affected by these factors.

Divisions were identified and their corresponding means and standard deviations were calculated, for analytical reasons. These divisions, and their values (Appendix

C, Tables C1-C3), have been produced for the remainder of this questionnaire. As a precedent, the analysis studied the ‘overall’ attitude towards each question. Comparisons were then made within the divisions themselves, stated in ii)-iv) below, given any point of interest or contrariety. If there is little, or no, mention to these divisions, and their respective data, it was because the values were comparable. The list of defined sub-divisions are stated below, with their applicable tables of values in brackets:

- Every respondent as one sample; i.e. ‘overall’ perspective, (Appendix C, Table C1)
- the industry division; the oil and gas vs. construction, , (Appendix C, Table C1)
- the job responsibility division; i.e. Safety/risk, Finance, Gen. Management etc. (Appendix C, Table C2), and
- the respondents involved in the safety/risk category within the oil industry vs. the same people within the construction industry (Appendix C, Table C3)

4.3.1.1 Analysis of certain aspects of the respondents’ company (Question 4)

This question was aimed to ascertain the respondents’ feelings on the safety facilities of their particular company. Should an accident occur, this question identified their attitudes on the companies provision of education and training of safety, medical provisions, prevention methods and protection of the workplace from various outside factors.

This question was answered using a three box technique. The boxes indicate, for each factor, the competency of any one company as being excellent, adequate or indifferent. The numbers applied to these three classifications were 1, 2 and 3 respectively. So for example, if an average value of 1.50 was given for one of the factors, then the competency of that factor lies exactly between excellent and adequate, so would indicate a satisfactory competency level.

Referring to Table C1 in Appendix C and Figure 4.5, one can observe, when analysing the ‘overall’ replies, that the average values for all parts, a)-h), (definition of parts in questionnaire in Appendix A) of question 4 does not exceed 2. The range is more specifically between 1.44 and 1.93. This suggests that *on average* respondents regard their companies as being sufficiently competent at all the factors. Part e), which refers to the prevention of sabotage, is regarded by the construction industry to be less than an average risk, whereas the oil regard it far higher. This is probably due to the physical positions of the respective working environments. Also, a sabotaged oil installation could result in huge costs to the company, as opposed to a construction yard or office, so more attention is taken to combat such an eventuality.

When viewing the two different industries individually, there is a definite distinction. The shape of the replies follow similar paths, but the replies from the oil industry are all averaged lower, except part a). Education/training in safety was perceived to be similar, with values of 1.52 and 1.40 for oil and construction respectively. This suggests a high level of competence. These attitudes and perceptions of safety, from both industries are investigated further throughout this questionnaire. These ‘marks’ allocated are thus tested and verified. The other parts, however, are all substantially lower. In summary, the attitudes of the respondents from the oil industry convey an impression that their companies are extremely competent at preventing accidents in the first place, but also at providing sufficient protection should one occur. The replies from the construction industry are more intermediary.

4.3.1.2 Analysing whether the physical conditions lead to accidents at work (Question 5)

The following 6 questions, i.e. ques. 5-10 inclusive, used the following ranking system, ‘Considerably yes 1 2 3 4 5 Not at all’.

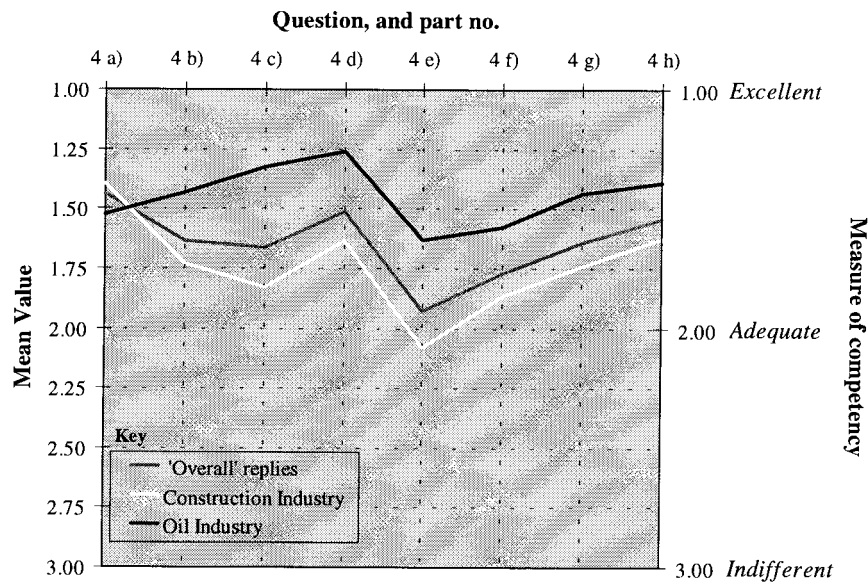


Figure 4.5 A measure of some safety facilities for the oil and construction industries, individually and together.

The objective of question 5 was to show how important it is to maintain a high level of working conditions. This question asked the respondents whether an accident could occur due to increased levels of physical conditions at the workplace. Quite predictably, the 'overall' average value was 2.04, which implies a 'yes'. This value does not alter by any significant amount between the replies of the two industries. This becomes increasingly more important, especially within the construction sector, having just scrutinised the previous question. The construction industry were only adequately competent with their safety facilities at providing protection should an accident occur. Now, having analysed question 5, which suggests that the physical conditions at work do lead to accidents, one can clearly see that the importance of providing high standard of physical conditions is paramount.

4.3.1.3 Analysing some general questions on risk and risk management (Questions 6, 7, 8, 9 and 10)

Questions 6-10 are some general questions attempting to understand the conditions in which risk analyses are performed. This component contained five questions listed below, (using the same numbering of questions as in the questionnaire):

6. Is there sufficient inter-action between non-experts on the subject of risk and risk management?
7. Is the time span long enough for carrying out comprehensive risk management?
8. Is the reward a risk analyst receives for attaining a close risk estimate satisfactory?
9. Are you satisfied with the way your company manages risk?
10. Is it possible to improve on the way your company manages risk?

The questions were slightly slanted to those involved continually with risk management, i.e. the safety/risk job category; and as such were analysed from an overall perspective, an oil industry vs. construction viewpoint and from the personnel included in the safety/risk category from both industries. Table 4.5 contains the relevant information.

Values for the first question from all divisions concentrate around 2.6, which suggests there is *average* inter-action between non-experts and experts in the field of risk analysis. The communication lines, which are crucial in this field (Hadden, 1989), are average between the hierarchical positions within the organisations. This value needs improving, as identifying risks and proposing upgrades is not exhaustive, and enabling the non-experts entering discussions and meetings with the experts could be very fruitful, given the right circumstances.

The overall mean for the sufficiency of time for completing a comprehensive risk management programme is mediocre. However, it can be seen from Table 4.5 that this question is quite clearly divided between the two industries, and the respective safety/risk categories alike. The construction position is below a mean value of 3.0, which suggests their management of risk is more of a latest edition to the strategy of a project and as a result, is a rushed affair. The oil industry, by contrast, concentrates more on the time span. The oil industry tends to spend more time managing risk comprehensively, due to the vast amounts of financial outlay involved in any oil project. Thus sums of money that could be saved by incorporating risk management

outweigh the time spent producing it. Any unforeseen risk can terminate an oil project at huge costs to the client. The emphasis on equivalent risk within the construction industry is not so drastic. Having said that, the rank could still be reduced.

The number of replies to question 8 were less, as 24% of replies put the double question marks against it. However, question 8, in Table 4.5 attained the least satisfaction from all the divisions, without exception. The general attitude towards the reward for attaining a close risk estimate (using hindsight) is one of distinct dissatisfaction. The kind of reward that is referred to is a type of bonus, or financial incentive, to attain an accurate estimate, because problems arise if the estimates are over, or not, conservative enough.

The overall mean response to question 9 is 2.6, with a mean of 2.8 for construction and 2.3 for oil. While there is a little satisfaction in current risk management, there is a clear need for improvement. The fact that the respondents can only apportion a very ordinary average rank to how satisfied they feel the company manages risk, then there is no surprise to find a dismal outlook on the rewards scale. Many respondents probably felt the company's policy towards managing risk was not satisfactory enough, because of reasons such as little inter-action between experts and non-experts or the time-span is not long enough. If there is a general attitude that the techniques used are only adequate, then the results suffer, causing a snowball effect on the subsequent values resulting in an inaccurate estimate. The rewards are then not offered and the consequent feelings of the reward system are non-favourable, as shown by question 8.

This particular point was addressed in the next question, which asked the respondents to similarly rank the possibility of improving the methods of risk management. The overall mean is 2.36, reinforcing the response above. The respondents were then invited to identify how these improvements could be made and the responses illustrated the growing importance of risk management. There was a general need for

more and better risk management. The analyses should be extended to all aspects of the project with wider participation and regular re-evaluations. The methods could be improved through better data collection, focused research and objective evaluation of completed projects. There was a further identified need for guidelines for structured and systematic risk management. Other comments included more education and resources, re-assessment at regular intervals, better databases required and better communication lines to middle management and non-experts.

While a thorough and comprehensive management of risk would be a part of an ideal world, in reality the cost of same needs to be compared to the likely benefits. This aspect of costs was investigated by requesting information as to the proportion of a project currently spent on general management and further, on risk analysis. This issue of cost was analysed in detail in sections 4.7.1 and 4.7.2.

Division	Question 6		Question 7		Question 8		Question 9		Question 10	
	Mean	S.d.	Mean	S.d.	Mean	S.d.	Mean	S.d.	Mean	S.d.
Overall	2.65	0.86	2.83	0.98	3.16	0.89	2.64	1.00	2.36	0.96
Constr. Ind.	2.69	0.86	3.08	0.91	3.31	0.89	2.80	0.95	2.33	0.93
Oil Ind.	2.59	0.86	2.32	0.93	2.85	0.83	2.30	1.03	2.43	1.04
Construct. 'Safety/Risk'	2.31	1.03	3.00	0.91	3.70	0.82	2.62	1.04	2.50	1.24
Oil 'Safety/Risk'	2.63	0.83	2.37	0.96	2.92	0.79	2.11	0.74	2.47	0.96

Table 4.5 *Table containing means and s.d. for questions 6-10*

As can be seen from this list of improvements, one can understand that the area of risk management still requires continual research and development to make it into an exact science, if that is possible?.

4.3.1.4 *Analysing some company approaches and methods (Questions 11 and 12)*

Figure 4.6 summarises the spread of responses to both question 11 and 12 of the questionnaire. The columns are presented as percentages of the total replies for each

of the two industries. The five scale ranking extremes used for these two questions are illustrated in Figure 4.6. The 'overall' averages for questions 11 and 12 are 2.60 and 3.68 respectively. Although these values give a fair indication of the replies and the general feelings towards these questions, a broader outlook was necessary to attain a clearer perspective on how scientific and how far the companies, as a whole and as separate industries, were prepared to go to produce a risk analysis, and whether or not it was standard practice to employ consultants, or their own staff, to execute it. Question 11 asks whether their company produces a risk analysis using a formal, systematic approach or on an ad-hoc basis, or some form of combination between the two?. A formal method is one based individually around specific circumstances. The analysis is tailored directly to focus on any given scenario. It is usually very scientific, using the most recent computer packages and is almost entirely quantitatively based. Conversely, the ad-hoc technique uses more qualitatively based ideas and is generally less scientific, and is done in a slightly more random fashion. Eighty percent of replies to question 11 congregated around ranks 1, 2, and 3, with ranks 2 and 3 being equally popular. The percentages of replies for each rank between the two industries are approximately equitable. Very few respondents, especially from the oil industry, chose the ad-hoc method. This suggests that the majority of companies in both industries are realising the importance of a comprehensive risk analysis and are opting more for the formal approach. It would make interesting reading to compare the spread of answers to this question from 5, 10, 20 etc. years ago. Projecting ourselves 10 years hence, the author forecasts, given the ever increasing significance of risk analysis, that the spread of results will be exclusive to the first two ranks, i.e. 1 and 2. The ad-hoc approach for major projects will not become practical, due to increases in technology, design innovation, computer resources, project sizes etc. .

Question 12 finds out who performs the risk analysis. The extremes of the 5 scale ranking technique were, using consultants (rank 1) or in-house employees (rank 5), with ranks 2 to 4 denoting some form of combination between the two. Question 12's replies have been combined into Figure 4.6 for direct evaluation reasons. Question

12, unlike question 11, exhibits distinct differences in the responses from the oil and the construction industries. The construction industry seems to increase, from rank 1 to 5, exponentially, if not numerically, in shape. Seventy six percent of replies lie in ranks 4 and 5, which indicates strongly that the construction industry employ in-house personnel to conduct the risk analysis. Contrary to construction picture, the bulk of oil industry replies are contained within ranks 2 and 3, with rank 3 being the more dominant, with 56% of responses. This implies that the oil business employs external specialist consultants, to work in unison with their own in-house staff in order to produce their more formal risk analyses. The oil industry are contented to employ specialist consultants to perform the risk analyses, as they do not possess the resources themselves. On the other hand, the construction industry feel they occupy the manpower and the expertise to deal with such analyses. There are obvious advantages of both methods, but only an in-depth case study of many analyses from both sectors could determine which of the two methods is preferable, however, this is beyond the scope of this thesis.

An additional thought was that maybe a link was present between using a formal approach and whether that meant using consultants or not. This link was explored further by calculating the correlation coefficient (Chapra and Canale, 1989), which can range between 1 and 0. A correlation coefficient of 1 occurs when the ranks given for the 2 questions possess the strongest relationship possible, which can then be identified. Conversely, a value of 0 indicates no relationship whatsoever between the two ranking systems. A value for the correlation coefficient was attempted, for the two sets of response data, between questions 11 and 12. When testing this hypothesis a value of 0.138 for the correlation coefficient was returned. This value indicates no connection between the type of risk analysis practiced and the people who perform them.

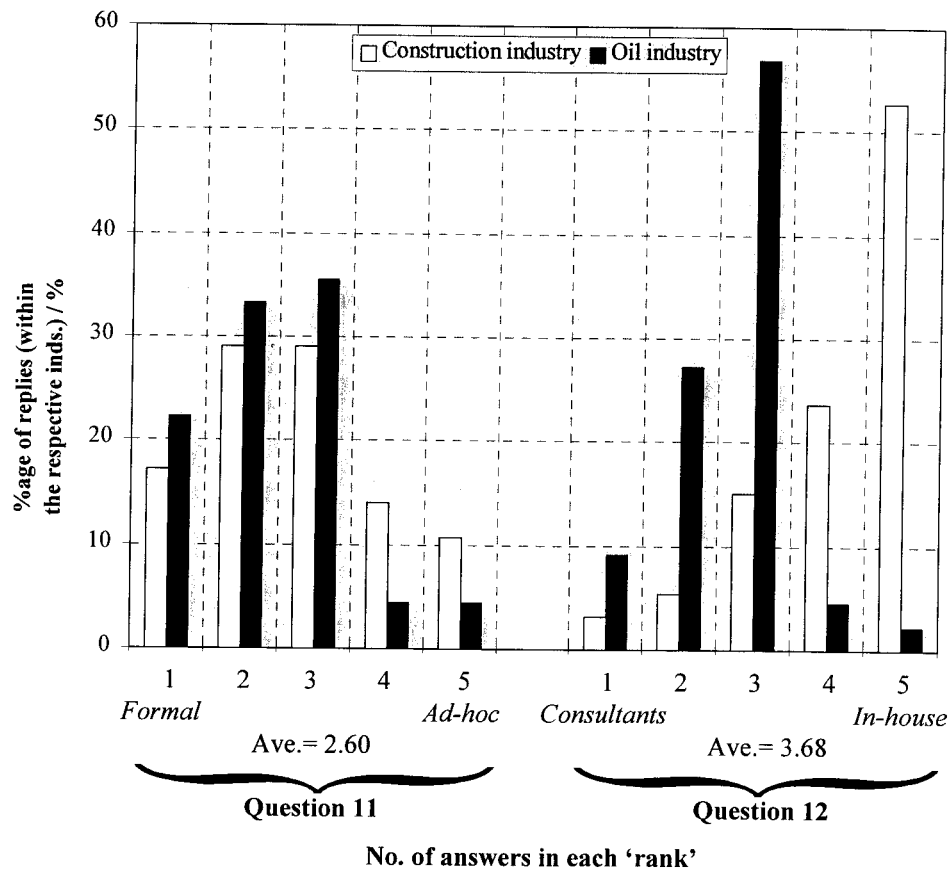


Figure 4.6 Spread of answers for question 11 and 12.

4.3.1.5 Analysing some personal characteristics of risk analysts (Questions 13 and 14)

Questions 13 and 14 represents another ranking system. Question 13 determines the ideal characteristics of an *individual*, and question 14 discovers what characteristics a *group* should possess. The ranking system was such that 1 pointed to a characteristic denoting 'very important', running through the scale to 5 indicating 'not important'.

Firstly, the characteristics pertaining to Figure 4.7 need some recognition. Question 13 has five parts, a) to e), and question 14 has four, a) to d). Each part denotes a characteristic, which are defined below:

Question 13

Part Characteristic

- a) Experience
- b) Age
- c) Leadership qualities
- d) Political standpoint
- e) Seniority

Question 14

Part Characteristic

- a) Different backgrounds
- b) Different ages
- c) Variety of characters
- d) The entire range of
- e) hierarchical positions

Figure 4.7 is divided into three classifications. The ‘overall’ viewpoint and the industry division. There is an average value for each of these three classifications, and for all parts of both questions, which is joined by a 3-D line to represent the change from one characteristic to the next. To ascertain the exact averaged values from Figure 4.7 see Table C1 in Appendix C.

The first detail to mention about Figure 4.7 is the congruence of the three divisions. The analysis of this questionnaire has already proved and will undoubtedly demonstrate again that the attitudes of the oil and the construction industries are often quite conflicting, but this is not true here. Nevertheless, the oil industry does deviate, if only slightly, from the construction in parts 13 d) (Political standpoint), 13 e) (Seniority), and 14 a) (Different backgrounds). More about that later though. If one differentiates between the important, from the not so important, characteristics of an individual who performs the risk analysis, it is clear, from Figure 4.7, that ‘experience’ is the overwhelming characteristic that stands out from all divisions. People learn from the experiences they have undergone in business and overcome, and learn from their mistakes, making sure their succeeding actions, thoughts and ideas are better than previously, hence ‘experience’ being regarded as the most important trait. The remaining four attributes all had average values close to 3.0, which equates to being ‘good if possessed but not crucial’. Leadership qualities and seniority, are regarded slightly more important than age or political standpoint (political standpoint, in this context, means position in the company, influence on

others etc.). Also, as mentioned earlier, the oil industry regard the final two traits, political standpoint and seniority, in less esteem than the construction industry.

The mean values of the industries for the characteristics of a group performing a risk analysis were very close. The only minor aberration from the norm was the relative importance of ‘different backgrounds’. The oil industry ranked it more important than construction. Even so, this aspect was still deemed the most important characteristic a group performing a risk analysis should possess. The spread of backgrounds can attain higher levels of feedback, resulting in more fluid discussions, thus achieving the maximum possible input and eventual output. For similar reasons, the variety of characters is perceived to be the next most important characteristic. The feature of age, in both questions, is considered least important, which is probably why such a diverse range of ages of employees are involved in risk analysis. Age in this field, so long as the younger (and sometimes older) element have sufficient experience, is not significant.

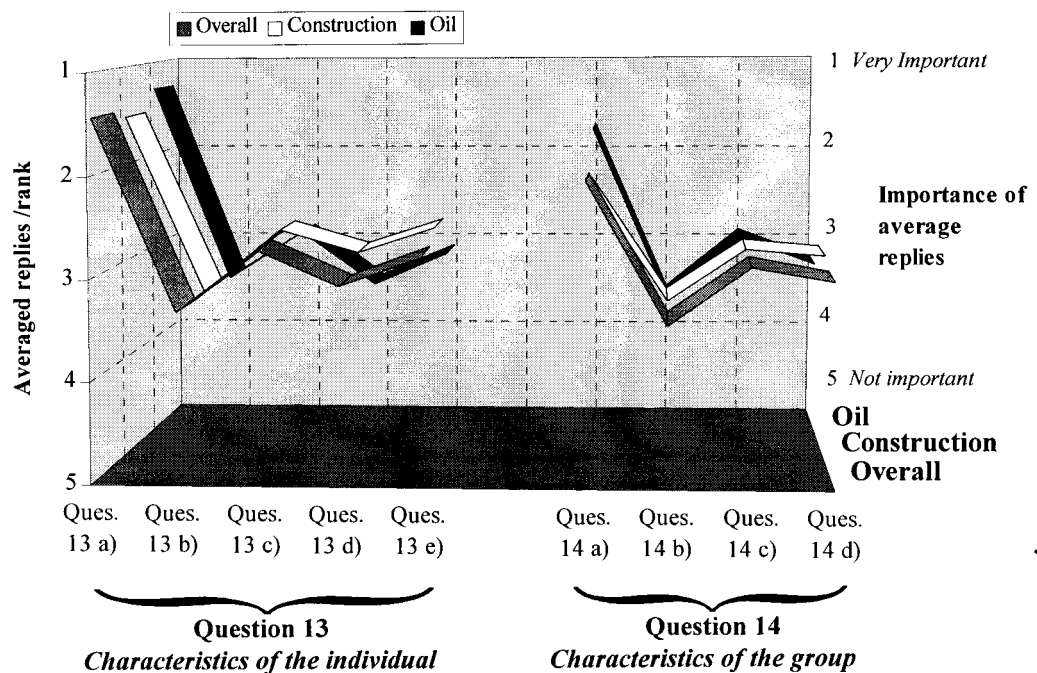


Figure 4.7 *The averaged importance of certain characteristics for risk analysts, individually and when grouped.*

At the end of both questions, 13 and 14, there is a space for the respondents to add any further characteristics. Some of the more standard replies to question 13 were specialist safety training and expertise, familiar with software, intelligence/ imagination, technical expertise and financially aware, and to be practical, open minded and be able to think laterally. Other answers for question 14 included knowledge/experience spread, clients' and designers' participation in project risk analysis, understanding of the subject being assessed, and prevalence of 'common sense'.

4.3.1.6 *Analysing some general risk scenarios (Questions 15 and 16)*

Questions 15 and 16, as well as questions 17-19 inclusive, are all of the box answering technique. Question 15 asks the respondent how risk averse they feel their company is, by posing 3 scenarios receiving a specified financial gain, with an associated percentage chance, against a chance of losing money. Do they rate themselves as being risk averse (assigned box number 1), risk neutral (number 2) or risk seeking (number 3)? This question starts to illustrate how conservative the companies are towards risk and demonstrates how much respect is given to it. The 'overall' replies are depicted in Figure 4.8.

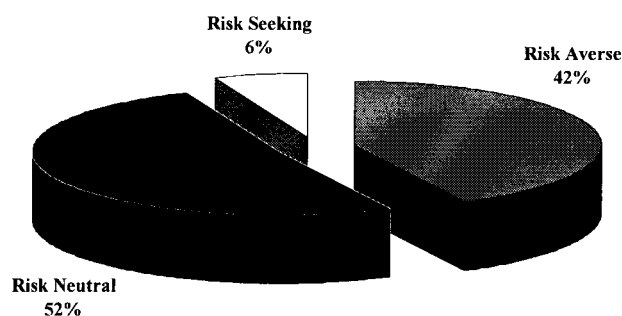


Figure 4.8 *Percentages of replies representing companies being risk averse, neutral or seeking*

From Figure 4.8, it is clear to see that the companies, as a whole, are more risk averse than seeking. Just over half the replies answered risk neutral, with 42% answering risk averse, leaving a total of 8 responses out of a possible 132 answered risk

seeking. Four of these 8 were from the construction industry and four from the oil. This implies that both industries are quite tentative in their quest of analysing risk. The preference is to be more conservative and not achieve such a high gain than to risk being too bold and resulting in a loss. This trend could, in time, change towards risk seeking once the companies feel more confident with the methods adopted to analyse risk. Then again, risk is a phenomenon which can, and often does, produce an uncertain world, and as a result attaining total confidence in such methods may never be possible.

Question 16 then inquired whether the people performing the risk analyses are risk averse, neutral or seeking (depending on their answer to question 15) because of their own personalities or are they instructed to follow the policies of their company. The answers analysed from all the possible divisions agreed to such an extent that the proportions of the replies were almost identical. The preponderance of replies (74%) were that people who perform risk analysis are risk averse, neutral or seeking, because of their company's policy. Eighteen percent felt that it was the risk analyst's own personality which determined how risk taking they were. This leaves 8% which believes it is a combination of the two. So, when certain risk scenarios present themselves, it is, more often than not, the policies of the company that dominates the decision process.

4.3.1.7 Analysing some traits of different bodies of people (Questions 17, 18 and 19)

Utilising the box answering technique again, Questions 17-19 inclusive, are about certain bodies of people involved directly to the risk areas and seeing how they perform under these conditions. Question 17 concerns itself with workers in high risk areas. Question 18 ascertains whether female employees behave differently to males and question 19 compares older workers with younger ones.

Question 17 has two parts to it. It asked whether workers in high risk areas trust their individual skills to a) cope with the accident risks and b) accept high risk levels. The

two parts require a simple tick in a 'yes' or 'no' box. Question 17 a) was unanimous in its answer. Of the 130 replies to this question, 93% (or 120) of replies answered 'yes', the workers do trust their individual skill to cope with accidental risks. However, not all of them accept certain levels of risk readily. From the 'overall' responses, well over half declared that the workers did not accept high risk levels, but trusted their individual skill to cope with them if needed.

Approximately half the respondents from the construction industry stated a yes to part b) while the other half said no. The oil industry were more clear cut, almost three-quarters of replies rejected the claim that workers in high risk areas accept these levels. A possible reason for the distinction between the two industries could be the nature of the work. The employees involved in high risk areas in the oil industry are the people offshore who, unlike in areas of construction, are continually dealing with hydrocarbons which are highly flammable and harmful if exposed, with additional risks such as adverse weather conditions. Therefore, the risks are always of a high nature. Obviously, the high risk areas in the construction industry are potentially dangerous, but are more controllable by the workforce as a team.

Question 18 asks whether women are more risk averse than men. A total of 132 actually returned an answer to this question, but 79 of them did not know. This was probably due to the limited number of women working in the risk areas of either industry, i.e. areas such as production, fabrication, transportation, manufacture etc. and not design offices, general offices etc. Of the remaining 53 answers, there was an even spread with 23 answering 'yes', 21 replying 'no' and 9 responding with 'only in certain situations'. The problem with this question was the fact that so little women are involved in the risk areas, therefore, this question could be biased, or influenced, by the actions of one or two women. If these one or two happen to be particular risk averse, the respondent replied accordingly, and vice-versa. Comments were added to this question with the sample agreed on the fact that women are more level-headed and take a step back from the action in order to assess mentally before pursuing, but all this could sway the scales to risk aversion, and women being the more averse to

risk. However, *the most* frequently added comment was, ‘insufficient sample size’, and until more women are integrated in the higher risk areas, then no reliable conclusion can be made.

Question 19 was very similar to 18, but the hypothesis in this question was whether the older workers are more risk averse than the younger ones. Again, there were ‘don’t knows’, 35 in all. This left 102 replies for the ‘overall’ analysis. Once more, the problem when asked a question like this, which is just human nature, is to think of a couple of good, or bad, examples within the variable and assess them rather than globally. Although, as there is a larger sample size, conclusions are more valid. Forty three percent of the older workers replied with a ‘yes’ to being more risk averse. The reason was probably due to experience and learning from their own, and others, mistakes. The accidents that they have seen, or been involved in, could be a reason for being more risk averse than the younger, less experienced, fearless employees. This argument could be turned on its head, by saying the older workers could be more risk taking than their younger counterparts for reasons such as taking things for granted, and having seen the possible accidents saying, ‘that could never happen to me’ as well as reasons given in question 17 of trusting their own individual abilities to cope with accidental risks. Also younger employees could be more risk averse because of the ‘stories’ they have heard, and been told from the older workers. This is why the answer ‘no’ to this question is also quite popular, with 36% of replies.

4.3.2 Company policies when responding to risk (Question 20)

The selection of which method to use to respond to risk is an important one and requires considerable attention. However, the choices available are varied and include risk transfer, risk retention, risk reduction and risk elimination. Each of these techniques were discussed in section 2.5. These 4 techniques can be used singularly or as a combination. The objective of question 20 was to evaluate which of these techniques are practiced.

Question 20 used the answering technique of identifying the possible options which each had related boxes. The respondent was required to tick the relevant box, or boxes, if their company employed that technique. The response to this question then determined which sections the candidate then went on to completing. Alongside each of the boxes were directions for the respondent to follow. There were 7 options to question 20. These were the 3 main response methods, namely transfer, retention and reduction, which each had a further individual section of their own, where more specific aspects of the response method was requested. Risk elimination, being a small response technique was divided into 3 options for question 20 as there was no additional section in the questionnaire. The three elimination methods, (a), (b) and (c), in the questionnaire, are:

- a) Contractor not placing a bid,
- b) Contractor tendering at a very high price, and
- c) Owner not proceeding with project funding.

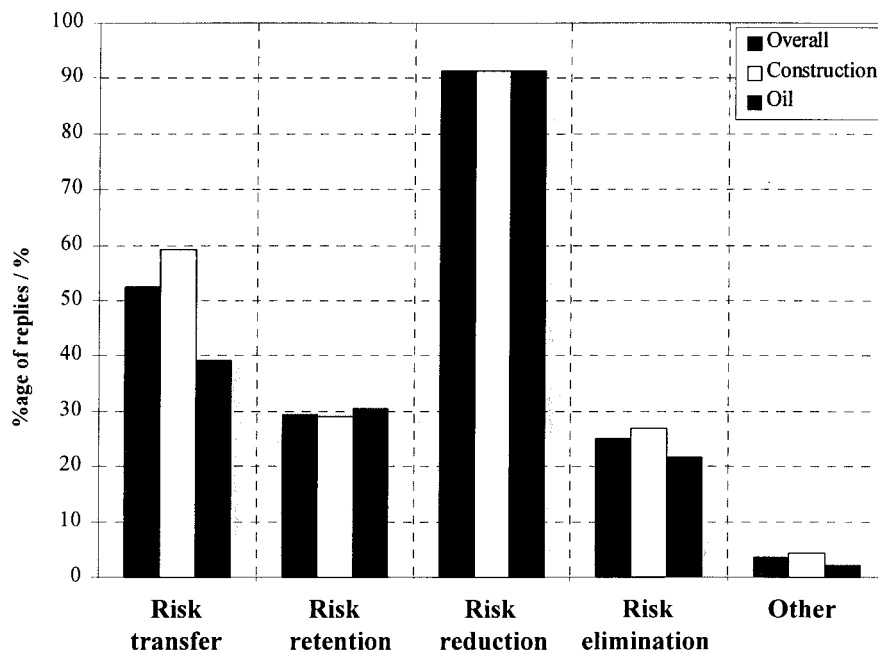


Figure 4.9 *Methods used when responding to risk.*

The only other option was an 'Other' method specified in a space by the respondents if there were any methods which were not thought of. The replies pertaining to risk response are illustrated in Figure 4.9. The columns in Figure 4.9 are presented as percentages of the total replies for each of the three divisions (remembering 139 replies overall, 93 of those were from the construction industry and 46 from the oil), therefore, it is possible to obtain the specific numbers of replies that use any particular response method for each division.

The most popular method overall is clearly risk reduction. Only three respondents from the oil sector and eight from the construction claim that their company do not employ this technique. After risk reduction, there is a dramatic fall to the next favoured method, risk transfer. The method of risk transfer has the backing of 52.5%, or 73, respondents, just over half the tally for risk reduction. Falling almost half again, risk retention received 29.5%, or 41 votes, with the risk elimination methods, (a), (b) and (c), acquiring 25.1% positive replies.

Similar trends are observed within each industry. All four methods are used by the oil industry, but three of them are eclipsed by one prominent method, namely risk reduction, which obtains usage from 93% of respondents. Risk transfer is used by 40% of respondents, i.e. 18 replies, with only 14 positive replies for risk retention and 10 for risk elimination methods. Furthermore, all 10 responses for risk elimination stated that the owner/client did not proceed with funding the project. Neither of the other two elimination methods were supported.

Risk reduction and risk transfer are the two methods dominating the construction industry with 85 (91%) and 55 (60%) positive replies. However, this industry also has a number of replies for all the methods, so is more widespread than the oil industry. But the numbers do decline in a similar fashion. In fact, the general pattern of the two industries are comparable. Interestingly, when the construction industry eliminate risk, they do so either by not placing a bid, or tendering at a very high price.

The respective percentage proportions of the two industries towards the risk response techniques are very similar and this could suggest a link between the two. Perhaps the two industries manage risk from very similar bases, but then differentiate from there. Certainly, the ratios to question 20, with the possible exception of risk transfer, suggest there is more congruence between the two than was probably first anticipated. However, only the replies to the following sections, 4.4 to 4.8, indicate whether the risk analysis techniques, attitudes and procedures, are akin or divergent.

There were only five replies in the 'others' box to question 20. This suggests that when companies are responding to risk, the bulk of the methods used are those declared in question 20. The sections containing those methods comprise a large portion of the questionnaire. The five 'other' methods proclaimed after question 20 were negotiation; ignore it; identifying and pricing risks, and apply ALARP (as low as reasonably practicable) principles.

Within the response methods themselves, there are many alternative ways of reacting to a risk. The following sections (4.4 to 4.6 inclusive) discuss the three main techniques further.

4.4 Analysis of Section 3 of the Questionnaire

'Risk Transfer'

Sections 3, 4 and 5 in the questionnaire contain information on the three most common ways of responding to risk. This section, on risk transfer, is the first of the three techniques. Risk transfer is by strict definition a form of risk reduction, but is being examined separately because of the numerous ways in which the risk can be and is transferred. Risk transfer is used by over 52% of the respondents, and the purpose of this section of the questionnaire was to identify the techniques most commonly used.

For the next two sections, 3 and 4 in the questionnaire and sections 4.4 and 4.5 in this thesis, it is important to mention that the conclusions drawn from these sections are from the available data, or sample size, remembering that reasonable conclusions can be made from a sample size of 20 or more (see section 4.1). It is recognised that the replies to the questions in these sections, are less than for any other section. Therefore, it must be kept in mind that the values and conclusions obtained, are from a proportion of the total responses. This fraction is stated at the start of each section and question. Section 5 of the questionnaire (or section 4.6 in the thesis), which is the third section on a method to respond to risk (risk reduction), does not contain the problems set down above, as the replies to this section are represented by an almost maximum response.

Seventy three respondents out of a possible 139 replies claimed their company uses risk transfer as a method of responding to risk, see Figure 4.9. This can be further broken down into 55 replies from the construction industry and only 18 from the oil. The relative percentages for the construction and the oil industries are respectively 59% and 39%. This technique is dominated by the construction industry, but probably by not as much as the actual numbers of completed questionnaires suggested.

4.4.1 Analysing the methods of risk transfer (Question 21)

The first question, 21, investigated the frequency of risk transfer either to a specialist sub-contractor or through financial means such as insurance. Some other examples of how the transfer methods are done are stated in section 2.5.2. Figure 4.10 illustrates the answers given from the industrial division perspective. Also shown on the figure are the extremes of the ranking system which was used. The averages and standard deviations of all these divisions are supplied in Table 4.6.

Using Figure 4.10 and Table 4.6 concurrently, one notices that both techniques are frequently used, but there are some distinct differences. The construction industry use

both methods frequently, but transferring risk to a specialist is used almost all of the time. Approximately 90% of replies were allotted in the first 2 ranks. They hire firms of sub-contractors, i.e. specialists in their particular field (e.g. electricians, joiners, welders etc.), rather than placing these workers on the payroll. Presumably, the reason for this is because the construction firms do not require these workers all year round. The oil industry, on the other hand, are more reliant upon the risk reduction method, see Figure 4.9. Within risk transfer though, of the 18 oil replies, the bulk of the replies stated that they financially transfer a lot more often than using a specialist. Although specialists are used by a handful of companies, 37.5% from this sample declared they *never* use them, reducing the mean for this method to 3.00. Even though the sample size for the oil sector is small, this is the difference between the two industries; the construction industry is very dependent on both methods of risk transfer, whereas a selection of firms from the oil sector are only partial to transferring risks financially.

Division	Ques. 21 a) Transferring risks to a specialist		Ques. 21 b) Transferring risks financially	
	Average	S.d.	Average	S.d.
Overall	1.84	1.09	2.15	1.05
Construction Ind.	1.54	0.75	2.22	1.07
Oil Industry	3.00	1.41	1.94	1.00

Table 4.6 *Averages and standard deviations for the overall, construction and oil industries for question 21*

4.4.2 *Analysing the methods used for financially transferring risks (Question 22)*

There are a number of different ways in which a company can transfer their risks financially. This was further investigated and the results are given in Figure 4.11. The ranking system for this question is identical as the previous one. Question 22 follows on directly from 21, by splitting up the financial transferral method to ascertain the different possible ways of performing this task. Figure 4.11 has all the necessary data. Again, each technique has an ‘overall’ viewpoint, which is then subdivided up into the two industries. The averages were the only information required,

as all the respective standard deviations were very similar, see Table C1 in Appendix C.

Transferring the risk to an employee through higher remuneration, d), is clearly not a method favoured in either industries. There are a few instances where the risk is transferred up the chain, c), to the client, who either retains or further transfers the responsibility through insurance. The most popular methods are via insurance, and exclusion or indemnity clauses in contracts. The frequency of usage of the techniques is similar between the two industries.

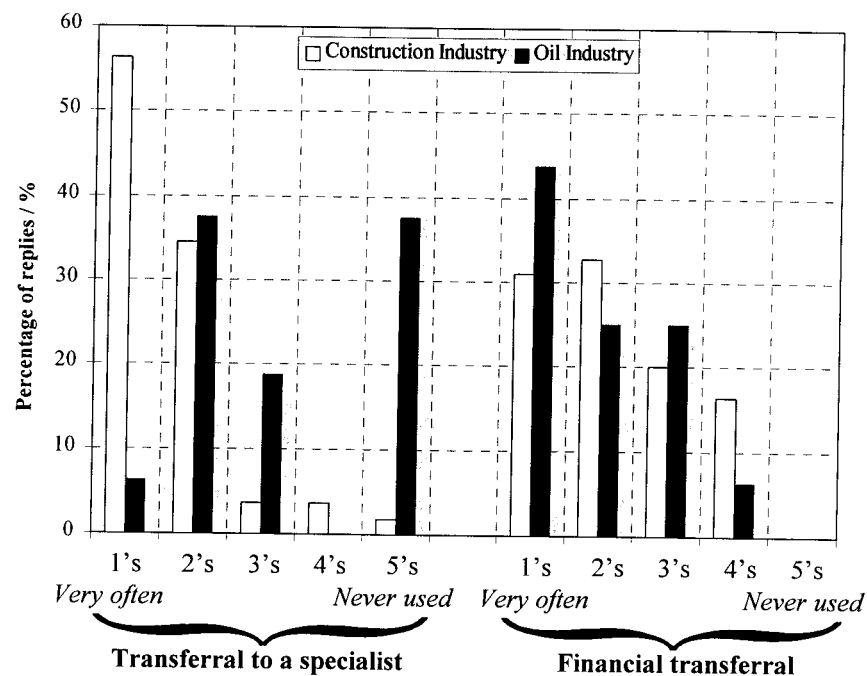


Figure 4.10 *A graph illustrating how often the two methods of risk transfer are used*

From Figure 4.11, the values suggest that the 'other' method is the most frequently used. However, one must remember that there is a sample size (in this instance) of only four, as opposed to between 63 and 66 for the other techniques, and respondents only declare other methods if they are utilised often, as those techniques spring to mind quickly. The methods put forward are also different but are grouped together as the 'other' methods. Therefore, the statistical values of these other methods should be

ignored, but are inserted for completeness. However, if a method is mentioned repeatedly, then it is highlighted.

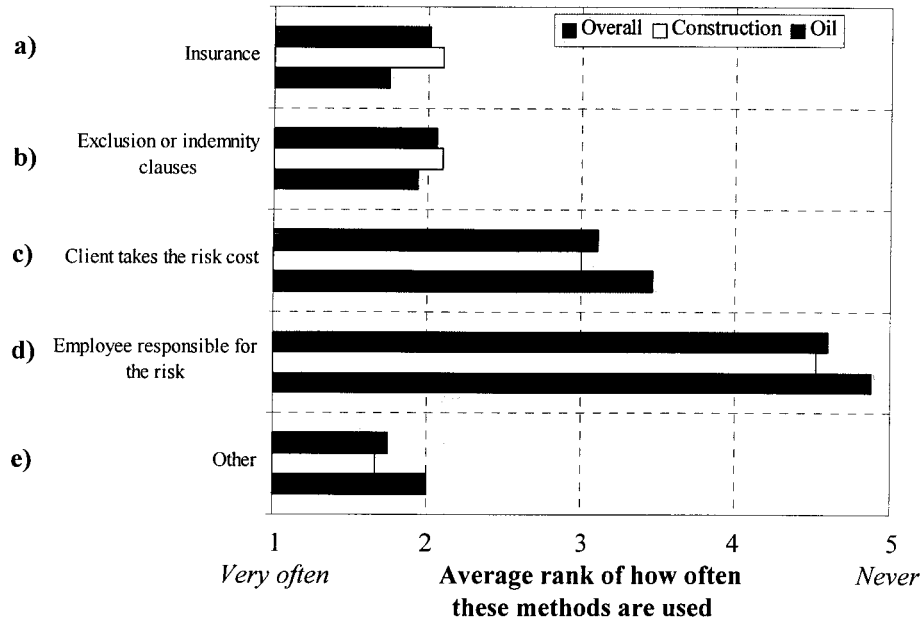


Figure 4.11 *The average 'rank' values for the financial methods of transferring risk from the 'overall', construction and oil viewpoints*

4.4.3 Analysing the financial limits of insurance (Question 23)

Predicting that insurance would be, and was, the most frequently practiced technique of financially transferring risks, the next 2 questions, 23 and 24, requested more information on insurance and insurers. Firstly, it was necessary to understand the financial limits set by the companies for insuring risks or whether they simply insured against all their risks. Fifty replies were quantified for this question, 37 of which were from the construction industry and the remaining 13 from the oil. From these 50, 22 respondents pronounced their company insures against all possible risk, whilst the remaining 28 insures under specific ranges. The same amount of respondents, from the two industries, replied for the two types of possible answers, proportionately, but the insurance ranges that were supplied, were quite different. Some of the responses were verbal comments such as, 'the range varies according to the type and location of the risk,' and 'the type of risk insured as opposed to the

value'. When numerical ranges were given the values supplied by the construction industry were in the 'thousands' bracket. The more common ranges were £10k-£100k, above £25k, £5k-£50M, above £10k, and £50k-£10M. The oil industry, conversely, started their ranges far higher, such as greater than £1M, above £5M, and one respondent replied greater than £50M. All this information points to the fact that the oil business is continually dealing with massive projects where the consequences of risks are colossal, thus accounting for the higher insurance limits. One also notices that all the oil ranges are 'above.....a certain value', which also implies more financial backing, or that they are using a captive insurance company (see section 4.4.6), as insuring against values above any specified limit ad infinitum can result in premiums being extremely expensive.

***4.4.4 Analysing the additional provisions the insurers provide and the value of those provisions
(Question 24)***

With the premiums the companies are paying, one would expect the insurers to provide extra services. This was the subject of question 24. This question aimed to understand the quality of the insurers used, by determining these extra services. Question 24 is a ranking system and is divided into two parts. The question suggested three extra provisions, as well as offering a space for any additional services. The respondent was required to circle both ranking systems, a) and b), for each provision. Ranking system a) determines whether there is provision in the first instant; rank 1 denoted 'provision' and rank 5 indicated 'no provision'. Ranking system b) then continues to find out whether that service is good advice or not; rank 1 indicated 'good advice' and rank 5 equalled 'bad advice'. Obviously, if the respondent answers 5 to part a), then there is no need to give a reply to part b). The non-response to this question followed the guidelines laid down in section 3.6.

Figure 4.12 illustrates the average 'overall' view to the replies from question 24. Although, it is denoted on Figure 4.12, the back four bars decipher whether there is provision or not, and the front four establish whether the advice is good, or bad.

The construction industry account for around 80% of the ‘overall’ results for this question, which leaves between 9-12 completed scripts, for question 24, from the oil sector. Therefore, concentrating on the ‘overall’ results, it is clear to see that ‘loss handling services’ and ‘loss prevention advice’ (these alternative services are discussed in section 2.5.2) are provided more often than not, with the quality of advice being satisfactory. Advice on ‘recovery of uninsured losses’ is rarely supplied. Although the oil industry had few responses, they seem to feel, in general, the provision of such services are not there and therefore the advice is regarded as bad. Maybe, it is because the advice in the past has proven to be below average and as a result do not request that advice again. This connection between the two ranking systems for all the replies is tested below, by ascertaining a correlation coefficient. The construction industry, unlike oil, are slightly more enthusiastic about these services. This does not dissuade one from the fact that the ‘overall’ perspectives on these services are average.

A correlation coefficient was found (definition in section 4.3.1.4) between ranking systems a) and b), for the three extra services to see if they was a relationship. The values of these coefficients for the three services, loss handling services, loss prevention advice and recovery of uninsured losses, were 0.81, 0.90 and 0.91 respectively, which suggests there is a firm relationship in the replies to the two ranking scales. This relationship is such that when an extra service is provided, whichever it may be, the advice which is delivered is of worthy quality, and vice-versa.

The ‘other’ service rated quite highly though, but for the same reasons given in section 4.4.2, one cannot assume these services are the most provided or best advised service. Respondents only reply to this part if there is a service worthy enough to submit, therefore the ranks given to their additional services are going to be high, resulting in a healthy mean. Some of the additional services submitted were insurance clauses in contracts, advice as to cover in respect of unusual contract clauses or risks, and contracts fully covered and advice given on each contract.

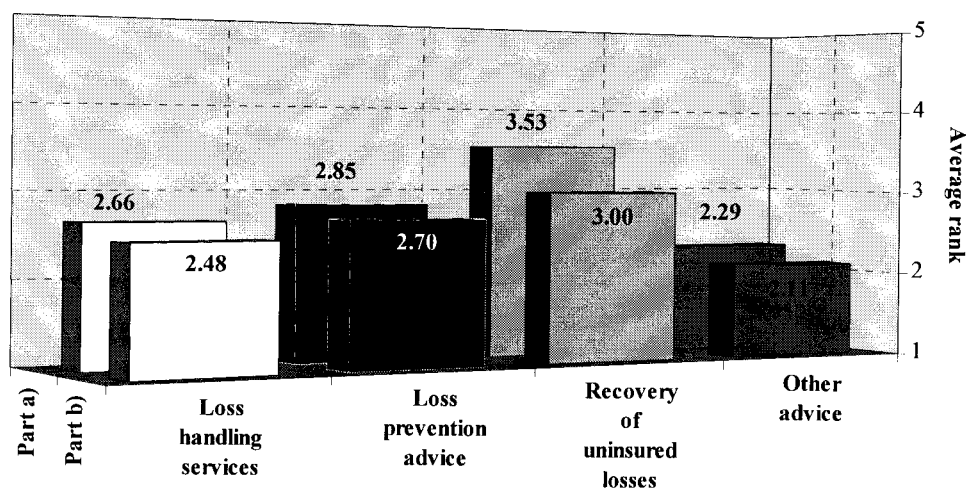


Figure 4.12 An 'overall' averaged view on insurers' extra provisions

4.4.5 *Analysing the proportion of replies who have 'shared' a risk, and the methods used to so do (Question 25 and 26, and 37 and 38)*

Rather than transfer all of the risk through insurance or to specialists, it is possible to transfer partially through a process of risk sharing. This was investigated next through a question which identified first whether the risk was shared and if so the frequency with which the risk was shared through; a) co-insurance; b) excess or deductible; c) first loss cover. As the section title reveals, there are four questions on the subject of risk sharing (methods and definitions in section 2.5.2). These two sets of two questions, 25 and 26 and 37 and 38, are in different sections within the questionnaire, but are identical questions. The reason for this is because risk sharing is both a method of risk transfer and risk reduction, and are thus in both sections of the questionnaire. This does not mean, however, that if one person answers the section on risk reduction, then they should have answered the section on risk transfer, as there are many other methods, and thus, questions on the respective risk response sections. As a result, the quantity of responses to these questions are different, because the method of risk reduction was more popular than risk transfer. Therefore, it is clear to see that a respondent could have responded to these two questions twice if their company employs both response methods. This, however, is not a problem,

because when a respondent answered the two questions twice the replies from the two sets were identical in every case. This scenario, however, counted as one. These were then added to the replies to the two questions if only one of the sections, 3 or 5, had been answered. There were 63 answers to the questions, 25 and 26, and 113 to questions 37 and 38. Fifty six of the 63 answered the sets of questions twice leaving seven respondents' answers independent of section 5. Likewise, 57 more respondents answered the questions in section 5 (as 56 answered twice equalling $56 + 57 = 113$) independently of section 3. Therefore, the amount of respondents replying to these questions on risk sharing totalled 120 ($56 + 57 + 7$).

The actual questions are posed so that the first of the set of two, i.e. questions 25 and 37, asks whether risk sharing is ever used when responding to risk. A simple 'yes' or 'no' answer was required. Then, depending on their choice to the first question, it was determined whether they were required to answer the next question. If the respondent answered no, they continued with the remainder of the questionnaire. If they replied with a yes, the respondent then ranked the three risk sharing methods in questions 26 and 38, on a scale of 1, denoting 'used very often' to 5, indicating 'never used'. Again there was an opportunity to add any other techniques practiced. The results from these 120 replies are summarised in Figure 4.13 and Table 4.7.

Seventy three percent of the entire sample of 139 stated their company has shared, or is sharing, a risk. The most frequently used method was to share the risks with an 'excess or deductible', see Figure 4.13 and Table 4.7. It is clear from Figure 4.13 that the majority of replies for this technique are stacked in ranks 1 and 2, hence a smaller variation from the mean of 1.23. The two other methods, 'co-insurance' and 'first loss cover', are not only used less often, but there is also a far greater spread of answers, suggesting that these methods are used only in certain situations. The proportions of replies from the separate industries, construction and oil, are very similar indeed, as are the means and standard deviations of the three risk sharing methods, therefore reference to the overall conclusions apply to the individual industries too.

Of the 17% who added another technique, most of them agreed on two further methods, ‘consortium agreement’ and ‘joint venture’. Again, for reasons similar to those in section 4.4.4, the companies that use these two techniques utilise them often.

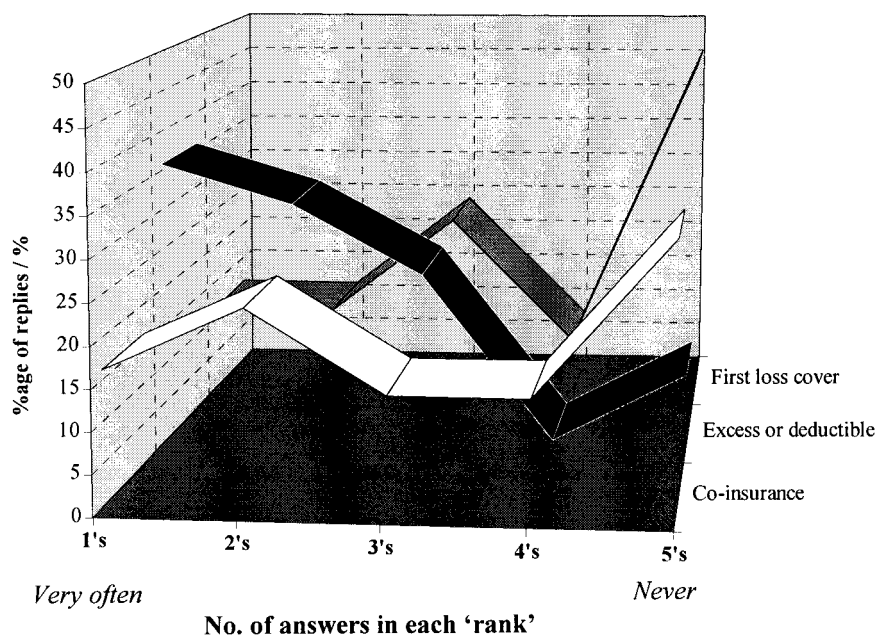


Figure 4.13 *A 3-D line diagram to illustrate the spread of answers for the three risk sharing methods*

Method	Number of replies	Mean	Standard deviation
Co-insurance	80	3.23	1.52
Excess or deductible	81	2.19	1.23
First loss cover	79	3.65	1.44

Table 4.7 *Summary of the response ratios, means and s.d.'s for the risk sharing methods*

4.4.6 *Analysing the popularity and rationalism for using captive insurance companies (Question 27, 28, 29, 30 and 31)*

Section 2.5.2 defines the meaning and functions of a captive insurance company, as well as distinguishing the differences between them and ‘normal’ insurance companies.

The first three of this group of questions are simple yes/no questions, using boxes and the first of which is trying to find out whether their company has ever used a 'captive'. If the reply was no, then the respondent had effectively finished this section and continued on with the rest of the questionnaire. If, however, the answer was yes, then the respondent was required to fulfil the requirements of the questionnaire by retorting to the remaining four questions of this section. Once a yes is marked to question 27, question 28 follows on to ascertain whether the company still uses a 'captive', and question 29 asks if it is the most manageable way of insuring their risks. The percentage replies to question 29 are illustrated in Figure 4.14. Question 30 then returns to the ranking system answering technique, and determines the initial influential reasons for developing a captive, with the final question of this group identifying the problematic financial risks when insuring with such an insurance company.

A 'captive' is created, owned and insure the risks encountered by its parent organisation, and is not unusual to find it located in a tax haven, like Jersey or Andorra for example. Fifty eight respondents answered the first of this set of questions, with 27 of them replying that their company has used a 'captive'. This response equated to 19.4% of the whole sample. The subsidiary question established that all of whom are still actively using such a service and an indication of the success of 'captives' is derived from the results of question 29, where of the 27 respondents, 82% of them (see Figure 4.14) found that using a captive is the most manageable way of insuring risks. These 27 really are the only candidates who are in a position to reply to this question, as they have had experience in handling risks through captives. Although 11% disagreed, they still continue to use a captive. This suggests that captives are beneficial to the company once they are set up.

Identifying the influential reasons for initially developing a captive was the objective of question 30, see Figure 4.15. The answering technique employed for this question was a ranking system ranging from 'very influential', rank no. 1, to 'not influential', rank no. 5. One point of note, is that the conclusions from the analysis of the

questions 30 and 31, only have sample sizes of 15 to 25. This is only approximately 15% of the entire replies, and *must* be borne in mind. Hence, only the ‘overall’ viewpoint is studied.

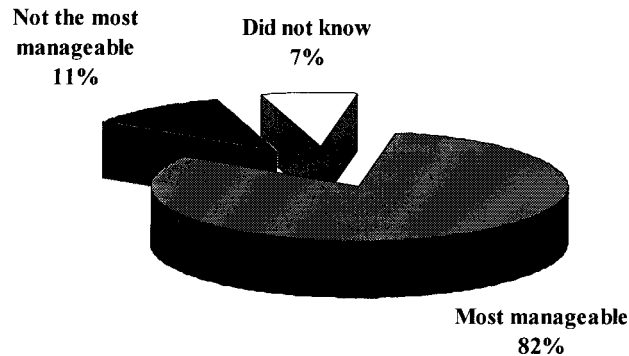


Figure 4.14 *Summary of whether captives are the most manageable way of insuring risks*

The main reason for developing a captive is ‘cost saving’. This is a factor not exclusive to risk as companies, big or small, engineering or not, are always looking for ways to cut costs. The captive is still in effect an individual insurance company, but to its parent organisation. Costs such as insurance premiums are obviously kept to a minimum and are far lower than would be attained from an independent company. Consequently, other companies also interested in decreasing expenditure should pursue such a system.

Another influential reason for developing a ‘captive’ is to facilitate ‘central control’. This can be very comforting as all departments, now including insurance, are all under one roof. This encourages compatibility and a feeling that all are working towards one goal, and thus relies on teamwork to achieve better results.

The final three factors, ‘lack of cover’, ‘tax savings’ and ‘tax havens’, are not quite as significant as the first two but can, in their own way, come under the headings of the two influential reasons, e.g. tax savings could be a sub-set of saving costs. By setting

up a 'captive' in a tax haven like Jersey, the company obviously reaps the benefits and saves costs accordingly.

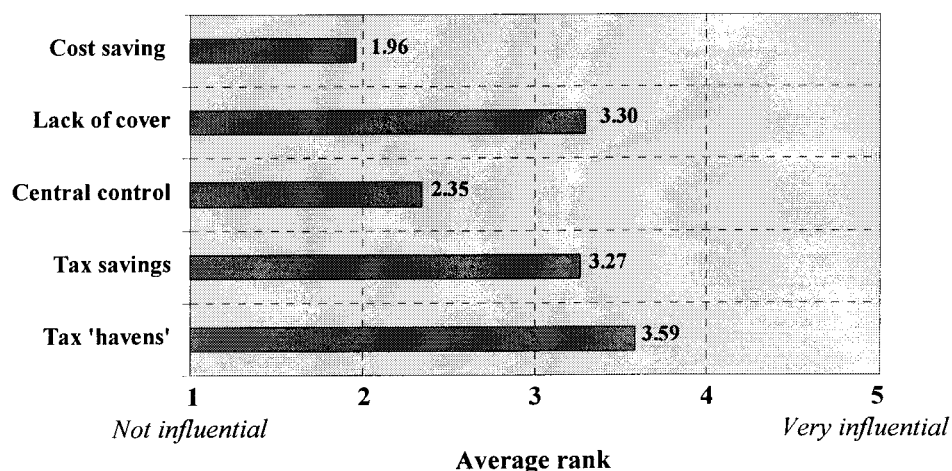


Figure 4.15 (Summary of) *The mean values of the influential initial incentives for developing a 'captive'*

The factors suggested in question 30 are all reasons which are positive towards possessing a 'captive', and could thus be regarded as advantageous, whereas question 31 are negative, with attendant disadvantages.

A ranking system is also adopted for question 31, where the extremes are 'very problematic', rank no. 1, to 'not problematic', rank no. 5, see Figure 4.16.

The first two financial risks, inflation and investment earnings, are problems which could occur in Britain almost as much as anywhere else. However, because captive insurance companies are sometimes established abroad in countries offering better tax savings, e.g. Jersey, Andorra etc., the 'International currency instability' becomes a factor, as the exchange monetary rate is determined by the stability of the country through Governments and politics. This factor, like the other two cannot be easily forecast and are therefore regarded as a problem directly associated with insuring with a captive insurance company.

Having studied Figure 4.16 the general attitude, albeit from a small sample, is one that regards the three financial risks from question 31 as being less of a problem than first predicted. Inflation and investment earnings are close to an mean rank of 3. This suggests that there can be a problem, but depends heavily on the nation's and the company's stability. The column representing international currency instability could imply that this risk is very rarely a problem. One must understand that if the 'captive' was situated in Britain then this is less of an issue, whereas a handful of respondents have presented it as very problematic, because their 'captives' are more likely to be located in a tax haven.

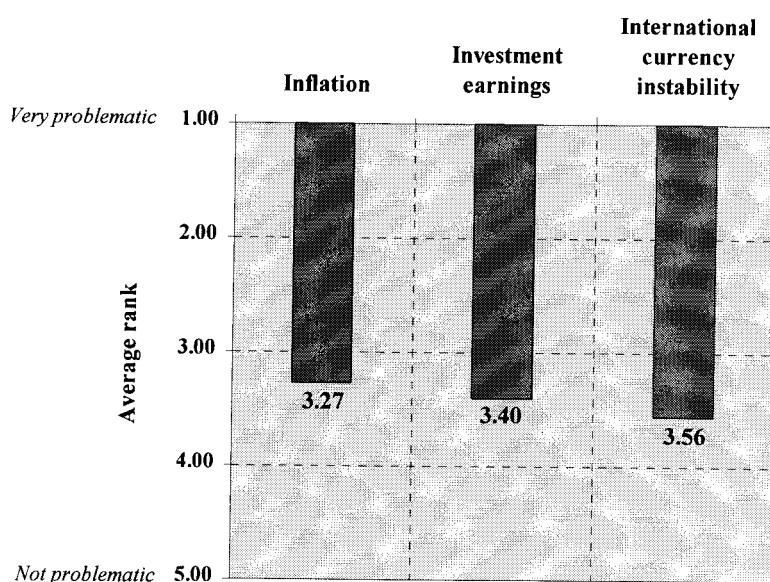


Figure 4.16 *Summary of the problematic financial risks when insuring with a 'captive'*

Summarising the results obtained from question 30 and 31, one concludes that the advantages of occupying a captive insurance company are cost efficiency, tax savings, and central control. The disadvantages are financially based risks.

4.5 Analysis of Section 4 of the Questionnaire

'Risk Retention'

The corollary to risk transfer is risk retention, and was investigated in the next section of the questionnaire. This section aimed to find out how and why the companies use risk retention as a means of responding to risk.

As mentioned at the outset of section 4.4, the conclusions produced in this section are from a smaller sample size. The replies to this section, even less than section 4.4, are just a fraction of the total completed questionnaires. Therefore, the values and conclusions obtained are from a percentage of the total responses. Only 41 respondents out of a possible 139 replies claimed their company uses risk retention, see Figure 4.9. This can be broken down into 27 replies from the construction industry and 14 from oil. Proportionately, that is 29% from the construction industry and 30% from oil. Therefore, the risk retention results are not conclusive by industry and a larger sample size would have been preferred in order to reinforce this statement.

4.5.1 Analysing the type of retained risks (Question 32)

There are two types of retained risks, namely active and passive. The method of actively retaining risks is a positive decision which requires identifying the risks, evaluating all outcomes, comparing it to other forms of risk response and then concluding that retention of those risks is the ideal solution. Conversely, passive risk retention is the failure to insure through neglect or absence of a decision. To ascertain the type of risks that are retained by the 41 respondents, a simple box answering question was postulated. Companies and risk managers can and do use risk retention to account for both types of retained risks, so in this question the respondent could tick both boxes if appropriate. The percentages of the 41 replies are presented in Figure 4.17.

Examining Figure 4.17, passive risk retention by itself is not supported. However, 7% of replies retained both actively as well as passively, which suggests this small proportion of respondents have encountered risks that were not foreseen and been forced to retain. Nevertheless, 86% of replies marked the actively retaining box, which by its definition suggests positive decisions being taken by those companies. Actively retaining risks implies plenty of time and money have gone into organising meetings to identify the risks, a lot of communication between all the hierarchical ranks during and outside these meetings, plus measures have been recognised which do not result in retention of passive risks. All possible outcomes have been evaluated and it suggests that risk retention is only used when the future events of a project are clearly mapped out. Obviously with risk, one can never be too complacent, as an unforeseen risk can occur at any time, and the three respondents who answered both boxes were the unfortunate ones to suffer.

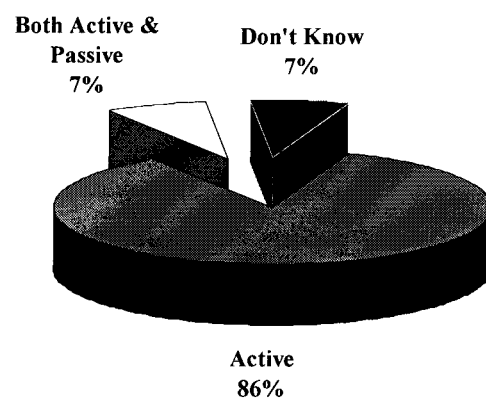


Figure 4.17 Percentages of the types of risks that are retained

4.5.2 *Analysing some of the reasons for retaining risks (Question 33)*

Eighty six percent of the sample for this section, i.e. 35 respondents, actively retain risks. The objective of the subsequent question was to investigate why this decision was made in preference to other response methods. The question was posed with three factors and a space for any additional reasons. The ranking system used was

identical to that for question 30 from section 4.4.6. The results are displayed in Table 4.8, with the notation fully characterised below:

Reason Full explanation:

- a) The required insurance premium is judged to be too high
- b) The cost of administering the insurance arrangement may be too high
- c) The loss prevention requirements of insurer are considered excessive
- d) Other: needed to be specified by the respondent

The principal reason was that the required insurance premium was judged to be too high. Sometimes insuring risks can result in such large premiums, and because the risks have assigned probabilities to them, of say 10^{-4} per annum, it is better, as the chance of the risk happening is slim, to retain that risk and not pay for insurance and their associated premiums. This is because the premiums could end up more expensive, by the time the risk occurs, if it occurs at all, than if one paid for the consequences themselves. Also, retaining the risk automatically attracts more attention to it and more effort is made to reduce the probability of it occurring.

Reason	Number of replies	Spread of results /Ranks					Averaged rank values	
		1's	2's	3's	4's	5's	Mean	S.d.
a)	31	12	13	5	1	0	1.84	0.82
b)	31	7	3	7	5	9	3.19	1.53
c)	31	5	7	12	2	5	2.84	1.22
d)	6	4	2	0	0	0	1.33	0.52

Table 4.8 *A table to exhibit the spread of replies, their means and standard deviations to expose the influential reasons for retaining risks*

Parts b) and c) are both more distributed across the board from ranks 1 to 5, evident from their large standard deviations. This is especially true of part b), the mean value lies very near to rank 3, with a prominent standard deviation, which implies some respondents feel this factor is very influential, whilst others do not.

Investigating the final row of Table 4.8, one finds a very low mean and standard deviation and a very clustered spread around rank 1. This, of course, refers to the 'other' reasons supplied by the respondents themselves. There were only 6 alternative factors and for reasons given in section 4.4.2, one must disregard the values and look at the 'other' reasons given. Five of the reasons given were obtained from the oil industry and one from the construction. The construction submission was 'performance'. The five oil reasons were 'asset replacement', 'asset replacement, not always relevant', 'uninsurable risk, such as weather downturn', 'excess', and 'exploration risk as part and parcel of Oil Co. work'.

4.5.3 Analysing the frequency of the methods used to finance retained risks (Question 34)

If the decision is made to retain a risk, it is necessary to be able to finance that risk. The final question of this section aimed to find out how often certain methods were used. The ranking system selected was identical to the one used for question 26 from section 4.4.5. The results are illustrated in Figure 4.18. The methods proposed to finance retained risks are provided underneath each column, except method b) which is abbreviated to 'Absorbing losses', its full title being 'Absorbing losses as part of current operating costs'. This method, with 'internal funding', or self insurance, are clearly the two identified methods which are used most frequently. All the remaining methods are all infrequently practiced, with the exception of diversion of internal funds, which was chosen by a handful of candidates.

As the analysis of risk becomes more and more of an integral part of major projects, especially with premiums and alternative responses becoming more expensive, risk retention is likely to become a much more widely used form of risk response. This response technique actively and positively accepts full control and responsibility of any risks which occur. This allows the companies to identify, measure and evaluate all the likelihoods and consequences of the risks and with the ever increasing confidence in the techniques to perform these tasks, it is forecast that more companies will elect to retain the risks in the future.